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Abbreviations: CTx = serum type I collagen carboxy-terminal telopeptide, a marker for bone resorption; P1NP = amino-terminal propeptide of type I procollagen, a marker for bone formation

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ABSTRACT

Uranium accumulates in bone, affects bone metabolism in laboratory animals, and when ingested in drinking water, increase urinary excretion of calcium and phosphate, important components in the bone structure. However, little is known about bone effects of ingested natural uranium in man. We studied 146 men and 142 women aged from 26 to 83 years who had used drinking water originating from wells drilled in bedrock on average for 13 years, in areas with naturally high uranium content in bedrock. Biochemical indicators of bone formation were serum osteocalcin and amino-terminal propeptide of type I procollagen (P1NP) and a marker for bone resorption was serum type I collagen carboxy-terminal telopeptide (CTX). The primary measure of uranium exposure was uranium concentration in drinking water, with additional information on uranium intake and uranium concentration in urine. The data were analyzed separately for men and women with robust regression (which suppresses contributions of potential influential observations) models with adjustment for age, smoking and estrogen use. The median uranium concentration in drinking water was 27 µg/l (inter-quartile range 6-116 µg/l). The median of daily uranium intake was 36 µg (7-207 µg) and of cumulative intake 0.12 g (0.02-0.66 g). There was some suggestion that elevation of CTx ($P=0.05$) as well as osteocalcin ($P=0.19$) could be associated with increased uranium exposure (uranium in water and intakes) in men, but no similar relationship was found among women. Accordingly bone may be a target of chemical toxicity of uranium in man, and more detailed evaluation of bone effects of natural uranium is warranted.